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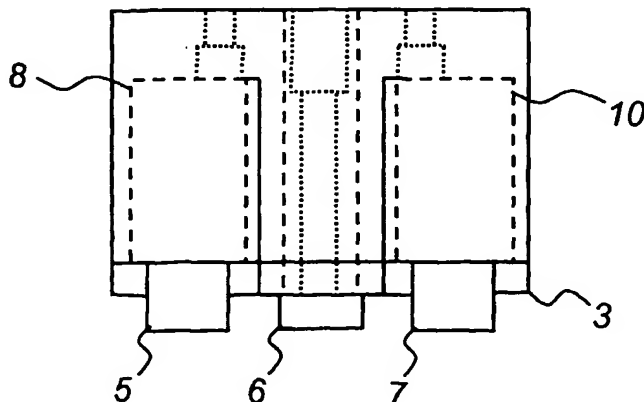
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TOOL FOR PIERCING NUT



(57) Abstract: The invention relates to a tool for piercing nuts, comprising a die part and a punch part and a piercing nut feeder incorporated into the punch part. The piercing nut feeder is adapted to feed piercing nuts into a piercing nut holder in the punch part so that these nuts, when the punch part is pressed against the die part by a press, are to punch holes in and be fastened to a metal sheet inserted between the punch part and the die part. A gas spring (3) is arranged between the press and the punch part, which gas spring (3) has at least one cylinder (5-7) and a piston (8-10) which is movably arranged in the cylinder (5-7) and which is aligned with the press, the pressure in the cylinder (5-7) being settable for adjusting the pressure exerted upon the piercing nut by the punch part.

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TOOL FOR PIERCING NUTField of the Invention

The present invention relates to a tool for piercing nuts according to the preamble to claim 1.

Background Art

5 Fig. 1 illustrates a prior art tool for piercing nuts which is adapted to fasten piercing nuts to metal sheet. This requires great accuracy for the nut or metal sheet not to be damaged and for the nut to be safely permanently connected to the metal sheet. A condition for
10 such accuracy is that the punch of the tool for piercing nuts bottoms with the correct pressure against the piercing nut, i.e. that the stroke of the punch is correctly set for the used piercing nut and the metal sheet in question. To achieve this accuracy within some tenths
15 of a millimetre, spacers, or shims, are currently used for adjustment in the shown prior art tool for piercing nuts. The shims are arranged between an adjusting plate and the tool for piercing nuts which thus is moved in its entirety by means of the shims. This mode of operation is
20 time consuming and still does not provide exact information about the pressure to which the piercing nut and the metal sheet are subjected. A negative effect on, for instance, the strength of the piercing nut owing to a punch pressure which after all is incorrect, thus cannot
25 be excluded. Moreover, it is necessary to completely stop the use of the tool for piercing nuts during the actual adjustment, which causes expensive production standstill when the tool is included as one of a plurality of tools in a long press line.

30 Object of the Invention

Therefore, an object of the present invention is to eliminate the drawbacks of the prior art tool for piercing nuts.

Summary of Invention

According to the invention, this object is achieved by a tool for piercing nuts according to claim 1.

Brief Description of the Drawings

- 5 The invention will now be described in more detail with reference to the accompanying drawings, in which
- Fig. 1 illustrates a prior art tool for piercing nuts;
- Fig. 2 is a side view of a gas spring;
- 10 Fig. 3 is a top plan view of the gas spring;
- Fig. 4 is a sectional view of the gas spring;
- Fig. 5 is a side view of the gas spring mounted in a tool for piercing nuts according to the invention; and
- Fig. 6 is a top plan view of the tool for piercing
- 15 nuts according to the invention.

Description of a Preferred Embodiment

- In the tool for piercing nuts according to the invention, the shims 1, mentioned by way of introduction, of the prior art tool for piercing nuts 2 in Fig. 1 are
- 20 replaced by a gas spring 3. The gas spring is shown in more detail in Figs 2-4 and in its position of operation in a tool for piercing nuts 4 according to the invention in Figs 5-6.

- The gas spring 3 comprises, as will be seen, three
- 25 pistons 5-7 which are movably arranged in a cylinder 8-10 each. The cylinders 8-10 are in a manner not illustrated in detail connected with each other (connected in series) to be able to be pressurised by a common source of compressed air (not shown). This source of compressed air
- 30 makes it possible to set in the cylinders 8-10 a pressure acting on the pistons 5-7 with a force that is suitable for the case of operation in question.

- The advantage of the gas spring 3 is that it makes it possible to exactly adjust the pressure exerted upon
- 35 a piercing nut by the tool for piercing nuts 4. It will be appreciated that the pressure exerted by the gas spring 3 is dependent not only by the actual gas pressure but also

by the surface area of the pistons 5-7. It will also be appreciated that the gas spring 3, when the tool for piercing nuts 4 bottoms when fastening a piercing nut, can perform a certain damping motion, the size of which greatly exceeds the damping motion which is allowed by the prior art shims (about 1.5 mm against about 0.1 mm). Owing to the invention, just a single initial adjustment is therefore necessary, and subsequently appearing minor deviations will not be important since they can be compensated for by the gas spring 3.

The maximum stroke of the pistons 5-7 of the shown gas spring 3 is about 12 mm. This means in practice that not even a case where two piercing nuts inadvertently land on top of each other in the tool for piercing nuts 4 will cause damage that will require stoppage for repair or even, as in the prior art tool for piercing nuts 2 with the shims 1, exchange of the entire tool.

The above-mentioned connection in series of a plurality of cylinders 8-10 renders it possible to make the gas spring 3 elongate so that it well fits the tool for piercing nuts 4 as such and also a press line, in which the tool for piercing nuts 4 can be included as one among a large number of other tools and in which therefore the available space is extremely restricted.

A person skilled in the art understands that the above-described tool for piercing nuts 4 according to the invention can be modified in various ways within the scope of the claims and, for instance, that the number of cylinders 5-7 in the gas spring 3 can be different from the one shown.

CLAIMS

1. A tool for piercing nuts, comprising a die part
5 and a punch part and a piercing nut feeder incorporated
into the punch part and adapted to feed piercing nuts
into a piercing nut holder in the punch part so that said
nuts, when the punch part is pressed against the die part
by a press, are to punch holes in and be attached to a
10 metal sheet inserted between the punch part and the die
part, c h a r a c t e r i s e d in that a gas spring (3)
is arranged between the press and the punch part, said
gas spring (3) having at least one cylinder (5-7) and a
piston (8-10) which is movably arranged in said cylinder
15 (5-7) and which is aligned with the press, the pressure
in the cylinder (5-7) being settable for adjusting the
pressure exerted upon the piercing nut by the punch part.

2. A tool for piercing nuts as claimed in claim 1,
c h a r a c t e r i s e d in that the gas spring (3) com-
20 prises an odd number of, however at least three, cylinders
(5-7) and associated pistons (8-10).

3. A tool for piercing nuts as claimed in claim 2,
c h a r a c t e r i s e d in that the cylinders (5-7) are
connected in series.

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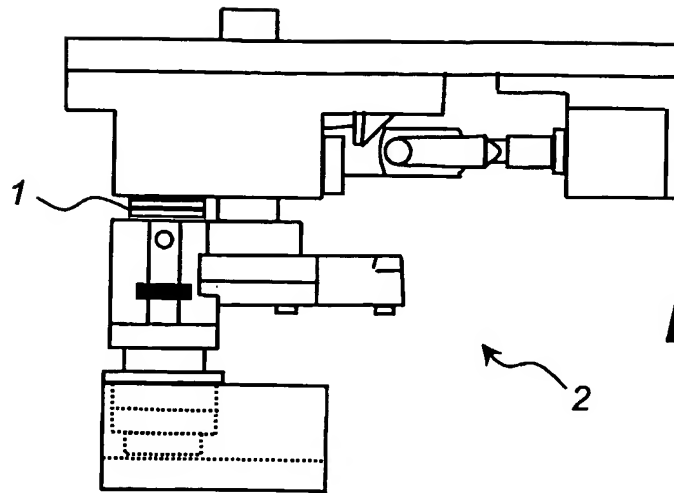


Fig. 1

Fig. 2

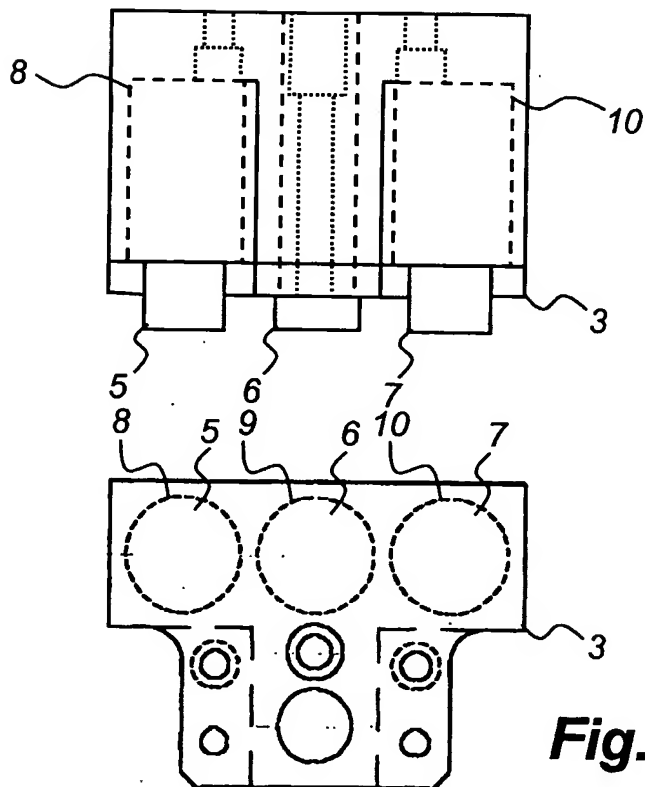
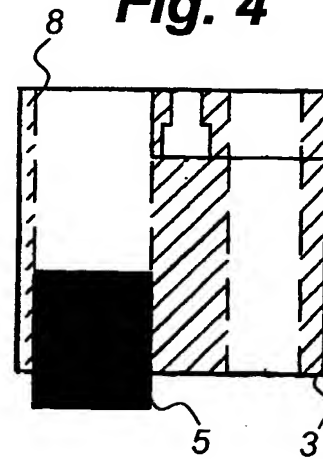
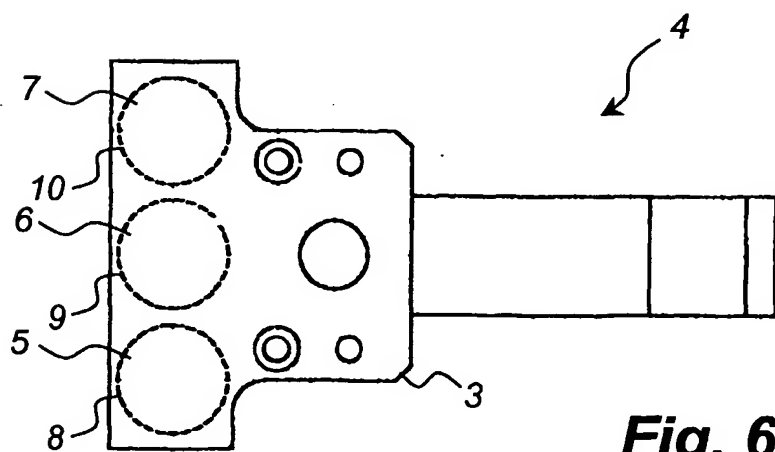
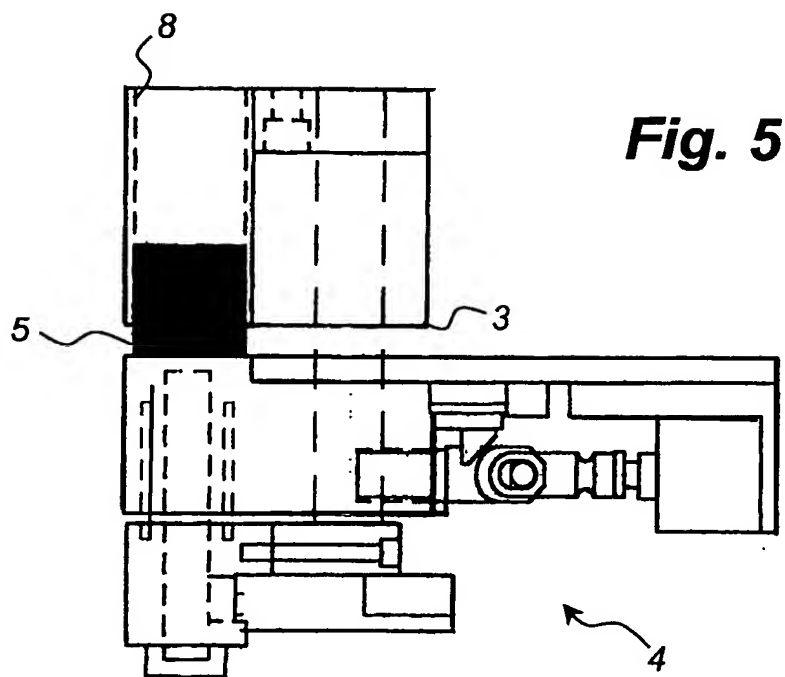


Fig. 3

Fig. 4



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B23P 19/06 // F16B 37/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16B, B23P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, PAJ, FULLTEXT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4570839 A (GORDON C. COX ET AL), 18 February 1986 (18.02.86), figure 5, abstract --	1
A	US 4785529 A (W. RICHARD PAMER ET AL), 22 November 1988 (22.11.88), figure 1, abstract --	1
A	US 4911592 A (RUDOLPH R. M. MULLER), 27 March 1990 (27.03.90), figure 5, abstract --	1
A	DE 19616475 C1 (BAYERISCHE MOTOREN WERKE AG), 3 July 1997 (03.07.97), abstract --	1

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>PATENT ABSTRACTS OF JAPAN vol. 1999, no. 08, 30 June 1999 (1999-06-30) & JP 11 070480 A (HONDA MOTOR CO LTD), 16 March 1999 (1999-03-16) abstract</p> <p>-- -----</p>	1

INTERNATIONAL SEARCH REPORT
Information on patent family members

30/12/02

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PCT/SE 02/01580

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	4570839	A	18/02/86	AT	55321 T	15/08/90
				DE	3280224 D	00/00/00
				EP	0076556 A,B	13/04/83
				SE	0076556 T3	
				GB	2106820 A,B	20/04/83
				JP	58071000 A	27/04/83

US	4785529	A	22/11/88	NONE		

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/12/02

International application No.

PCT/SE 02/01580

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	4911592	A	27/03/90	DE 3003908 A,C	13/08/81
				FR 2475163 A,B	07/08/81
				GB 2068493 A,B	12/08/81
				IT 1142246 B	08/10/86
				IT 8147654 D	00/00/00
				JP 1663771 C	19/05/92
				JP 2004804 B	30/01/90
				JP 56120807 A	22/09/81
				US 4459073 A	10/07/84
				US 4543701 A	01/10/85
				US 4633560 A	06/01/87
				US 4700470 A	20/10/87
				US 4713872 A	22/12/87
				US 4727646 A	01/03/88
				US 4765057 A	23/08/88
				US 4802803 A	07/02/89
				US 4893394 A	16/01/90
				US 4915558 A	10/04/90
				US 5067224 A	26/11/91
				US 5072518 A	17/12/91
				US 5092724 A	03/03/92
				US 5146672 A	15/09/92
				US 5172467 A	22/12/92
				US 5207588 A	04/05/93
				US 5237733 A	24/08/93
				US 5309618 A	10/05/94
				US 5439336 A	08/08/95
				US 5560094 A	01/10/96
				US 5564873 A	15/10/96
				US 5617652 A	08/04/97
				US 5673472 A	07/10/97
				US RE35619 E	07/10/97
				US 4555838 A	03/12/85
				US 4831698 A	23/05/89
				US 5174018 A	29/12/92
				US 5441417 A	15/08/95
				US 5644830 A	08/07/97
				US 5722139 A	03/03/98
				CA 1253317 A	02/05/89
				CA 1254777 A	30/05/89
				CA 1255880 A,C	20/06/89
				CA 1270368 A	19/06/90
				CA 1270388 A	19/06/90
				CA 1270389 A,C	19/06/90
				CA 1270391 A	19/06/90
				CA 1273187 A	28/08/90
				DE 3446978 A,C	14/08/85
				DE 3447006 A,C	11/07/85
				DE 3448219 C	10/05/90
				ES 290034 U,Y	16/11/86
				ES 290035 U,Y	16/11/86
				ES 538876 A	16/03/86
				ES 538877 A	01/03/86
				ES 548480 A	01/10/86
				ES 548481 A	01/10/86

INTERNATIONAL SEARCH REPORT
Information on patent family members

30/12/02

International application No.
PCT/SE 02/01580

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	4911592	A	27/03/90	ES	548482 A	01/09/86
				ES	8605079 A	01/08/86
				ES	8605620 A	01/09/86
				ES	8609612 A	16/12/86
				ES	8700096 A	01/01/87
				ES	8700097 A	01/01/87
				FR	2557227 A,B	28/06/85
				FR	2560305 A,B	30/08/85
				GB	2152415 A,B	07/08/85
				GB	2152862 A,B	14/08/85
				GB	2184378 A,B	24/06/87
				GB	2184379 A,B	24/06/87
				GB	2184510 A,B	24/06/87
				GB	2185204 A,B	15/07/87
				GB	2187986 A,B	23/09/87
				GB	8432236 D	00/00/00
				GB	8432237 D	00/00/00
				GB	8700622 D	00/00/00
				GB	8700624 D	00/00/00
				GB	8700625 D	00/00/00
				GB	8702237 D	00/00/00
				GB	8702238 D	00/00/00
				IT	1209836 B	30/08/89
				IT	1209929 B	30/08/89
				IT	8449223 D	00/00/00
				IT	8449224 D	00/00/00
				JP	2044315 C	09/04/96
				JP	2579897 B	12/02/97
				JP	2632137 B	23/07/97
				JP	7041357 B	10/05/95
				JP	7057409 B	21/06/95
				JP	8206769 A	13/08/96
				JP	8206770 A	13/08/96
				JP	60231544 A	18/11/85
				JP	60231545 A	18/11/85
				KR	9209486 B	17/10/92
				US	4610072 A	09/09/86
				US	4729163 A	08/03/88
				US	4810143 A	07/03/89
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DE	19616475	C1	03/07/97	NONE		
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